Journal of the Lepidopterists' Society
51(3), 1997, 237–248

A REVISION OF THE *CERASTIS CORNUTA* GROUP OF THE GENUS *CERASTIS* SUBGENUS *METALEPSIS* (NOCTUIDAE)

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ABSTRACT. The noctuid genera *Cerastis* Ochsenheimer and *Metalepsis* Grote are reviewed resulting in revision of *Metalepsis* to a subgenus of *Cerastis*. The *C. cornuta* group of *Cerastis* subgenus *Metalepsis* is defined. In addition to *cornuta* Grote, this group contains three new species: ***C. enigmatica***, new species from the Pacific Northwest; ***C. robertsoni***, new species from southern California; and ***C. gloriosa***, new species from the west coast of the continental United States. The species are illustrated and a key for their identification is presented.

Additional key words: California; Pacific Northwest; sphagnum bog; coastal chapparal.

Cerastis Ochsenheimer is a genus of 13 species of medium-sized moths which occur in temperate forests of the Holarctic region. They are unusual in the subfamily Noctuinae in that the adults are active in early spring, flying with species in the subfamilies Psaphidinae, Hadeninae and some Ipimorphinae (Xylenini: *Lithophane*, *Eupsilia*).

The North American species of *Cerastis* were previously arranged in two genera. Three species with foretibial spines constituted *Metalepsis* Grote. The type species of *Metalepsis*, *cornuta* Grote, 1874, occurs on the west coast and was thought to have a range extending north from its type locality, California, to the Alaska Panhandle. A new species allied to *C. cornuta* was recently discovered on the coast of California and Washington. Subsequent study of the populations previously considered to be *C. cornuta* revealed that these consisted of three allopatric species. *Cerastis cornuta* is restricted to central California and populations to the north and south of its range, although superficially similar, are distinct species differentiated by genitalic characters.

The relationship of *Metalepsis* to *Cerastis* was re-evaluated as part of our study of the *C. cornuta* group. McDunnough (1927), recognizing the close relationship of these genera, stated that "the male genitalia of the two genotypes are practically identical." He retained *Metalepsis* for the species with sclerotized setae ("spines") on the tibia of the prothoracic leg. This treatment was followed in subsequent checklists and cat-

alogs of North American noctuid moths (McDunnough 1938, Franclemont & Todd 1983, Poole 1989).

We retain *Metalepsis* as a subgenus, **new status,** of *Cerastis*. These two subgenera are distinguished by the shape of the digitus, the presence or absence of sclerotized foretibial setae, and the shape of segment A8 in the female. In subgenus *Cerastis* the digitus is immediately distal to the clasper and is free from the inner surface of the valve for most of its length, the foretibiae are devoid of setae, and abdominal segment eight of the female forms lobes which project into each side of the ostium bursae. In subgenus *Metalepsis* the digitus is fused to the inner surface of the valve for most of its length with only the apical third to quarter free, the tibia of the first leg bears complete inner and partial outer rows of sclerotized setae, and the ostium bursae is without lobes. There are seven species in subgenus *Cerastis*, *tenebrifera* (Walker 1865) in North America and six in Eurasia (Fibiger 1993). The six species in subgenus *Metalepsis* are restricted to North America. The revised status of *Metalepsis* results in the following new combinations for these species: *Cerastis cornuta*, **new combination**; *Cerastis fishii*, **new combination**; and *Cerastis salicarum* (Walker 1857), **new combination.**

The species in these subgenera share derived characters of adults and larvae indicating that they form a monophyletic group and should be united in one genus: male antennae bipectinate (reduced in *C. fishii* (Grote 1878) and the Old World *C. rubricosa* [Denis and Schiffermüller] 1775); head and thorax covered with hairlike scales; male genitalia with anellus sclerotized laterally and covered with short stout spines, valve with digitus but lacking a corona, and vesica coiled in a single loop with one or more large basal cornuti; female genitalia with bisaccate bursa and membranous ventral cleft in the sclerotization of the ductus bursae; larva with ridges on inner surface of mandible extending to the cutting margin without a tooth on the inner surface, and with stemmata 3 and 4 very close together, almost touching.

The presence of the digitus is unusual in the subfamily Noctuinae and is probably a primitive condition. *Choephora* Grote, type species *Choephora fungorum* Grote & Robinson, 1868, is the genus most closely related to *Cerastis*. The two genera share the distinctive characters of the anellus and larvae and the antennae, vestiture and shape of the valves are similar. *Choephora* differs from *Cerastis* in lacking the digitus on the valve and in its mid-summer flight season.

The *Cerastis cornuta* group includes four species, three of which are described as new. All four are restricted to the west coast of North America. The adults are easily distinguished from other species in the subgenus by the distinctive forewing spots which are conspicuously outlined with pale scales. The elongate oblique orbicular and reniform

spots are fused across the median space in most specimens, forming a broad V. The uncus of the male genitalia is broadest apically in the *C. cornuta* group but subapically in other *Cerastis*. The four species are superficially similar and can most reliably be distinguished by genitalic characters, however, subtle differences in wing pattern and length can be used to separate some specimens without dissection. Identification is simplified since only *Cerastis gloriosa* occurs sympatrically with other species in the group. *Cerastis gloriosa* is the most distinctive species and can usually be identified without dissection, allowing the three remaining species to be tentatively identified by geographic location.

The terminology for wing pattern and genitalia structures follows that used in the *Moths of America North of Mexico* series. These are illustrated by Hodges (1971: vi–vii).

Key to adults of the *cornuta* group of *Cerastis*

1. Orbicular spot mostly filled with white or pale yellow (Figs. 1–2); larger species, forewing length 14–17 mm; male antenna 2× as wide as the central shaft; clasper short, projecting posteriorly, not reaching dorsal margin of valve (Fig. 9); appendix bursae smaller than corpus bursae with ductus seminalis at posterior end (Fig. 13) ..... *C. gloriosa*

1′. Orbicular spot gray or brown, usually outlined in yellow (Figs. 3–8); smaller species, forewing length 11–15 mm; male antenna 3× as wide as central shaft; clasper extending posterodorsally beyond dorsal margin of valve (Figs. 10–12); appendix bursae larger than corpus bursae with ductus seminalis at anterior end (Figs. 14–16) 2

2. Vesica with a basal coil, bent ventrad 90° near base then to left, curving in an arc over 180° to project posterolaterally to the right (Fig. 10); appendix bursae joined to corpus bursae 1/3 from posterior end and extending obliquely towards corpus bursae anteriorly (Fig. 14); occurring in Cascades and West Coast from the Alaska Panhandle to northern California (Humboldt County) .... *C. enigmatica*

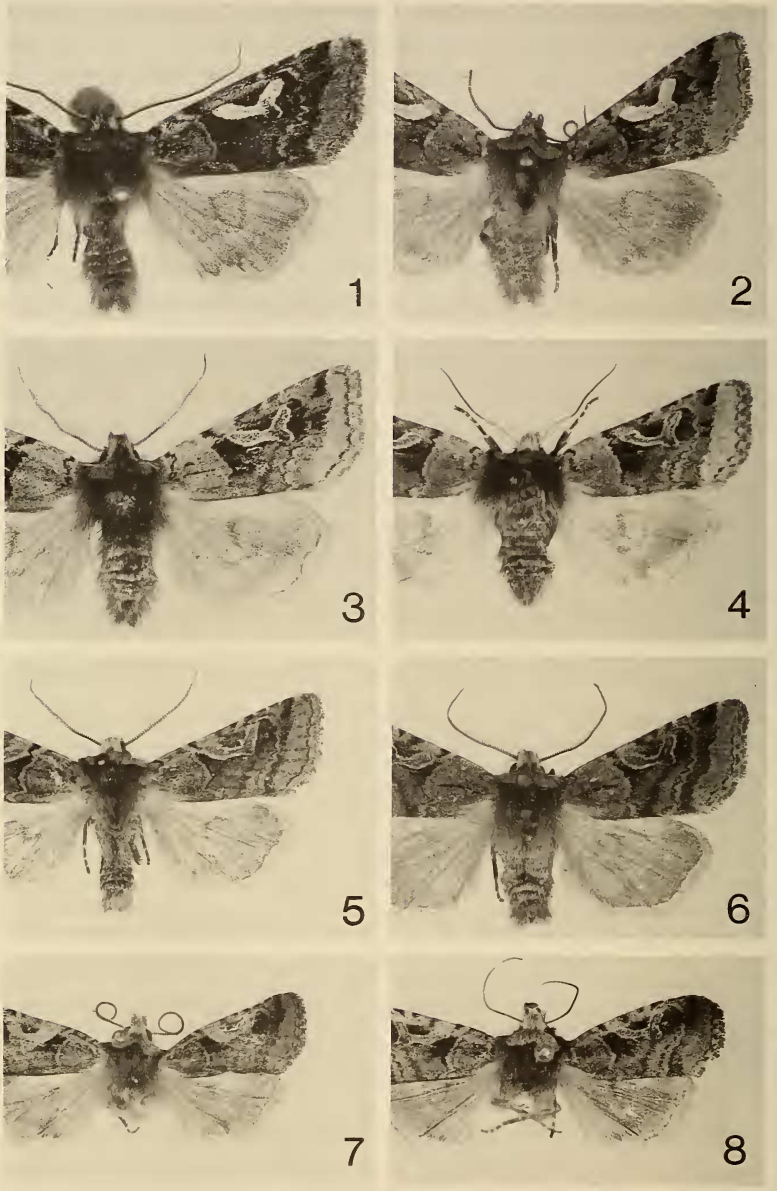
2′. Vesica bent 90° once or twice at base, then nearly straight (Figs. 11–12); appendix bursae joined to corpus bursae at posterior end and extending obliquely away from corpus bursae anteriorly (Figs. 15–16); occurring in western California 3

3. Vesica bending 90° ventrad near base, then straight (Fig. 11); appendix bursae even in width from base to apex, nearly straight, projecting slightly anteriorly at apex (Fig. 15); ductus bursae shorter, 1.5× as long as wide; occurring along the coast from San Francisco Bay to Sonoma County ..... *C. cornuta*

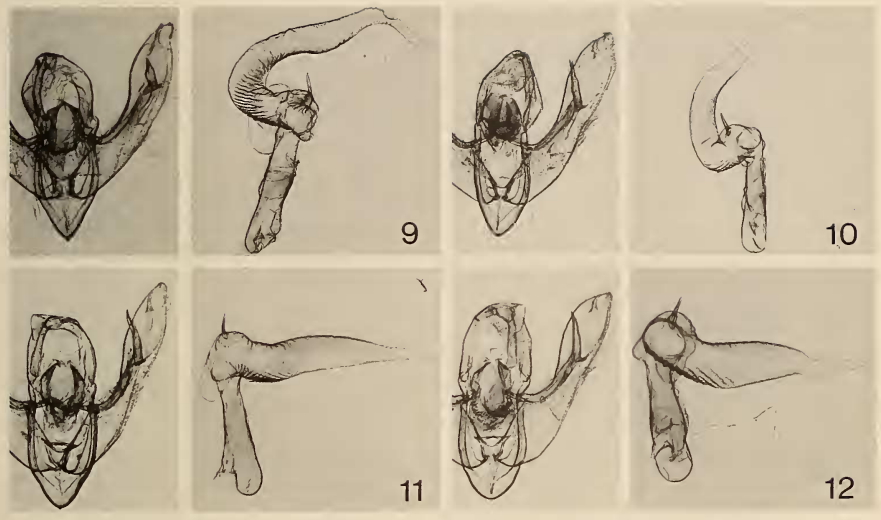
3′. Vesica with two 90° bends near base, bending ventrad for distance equal to aedaeagus width and then laterally to left (Fig. 12); appendix bursae constricted apically, curving dorsally at apex (Fig. 16); ductus bursae 2× as long as wide; occuring in Coast Range from Monterey Bay to Santa Barbara County *C. robertsoni*

Cerastis gloriosa Crabo & Lafontaine, new species
(Figs. 1, 2, 9, 13)

Description. *Male* (Figs. 1, 2): *Head:* dark reddish brown; palpi concolorous. *Eyes:* black. *Antennae:* bipectinate, 2x as wide as central shaft. *Thorax:* dark reddish brown; collar lighter, reddish brown with darker lines. *Foretibiae:* spined. *Forewing:* length 14–17 mm; dark reddish brown, suffused with variable amounts of black in discal cell; basal area with gray scales and violaceous tint; terminal area lighter than remainder of forewing, also with violaceous tint; lines double, black, pale filled; basal line sinuous; antemedial line oblique, gently excurved, notched sharply basad in fold; median shade usually obsolete, when present weak, wavy, evident only from reniform spot to inner margin; postmedial



FIGS. 1–8. Adults of *Cerastis* spp. **1,** *C. gloriosa* Crabo & Laf., paratype ♂, North Bay Bog, Grays Harbor County, Washington; **2,** *C. gloriosa* Crabo & Laf., ♂, Mill Valley, California; **3,** *C. enigmatica* Laf. & Crabo, holotype ♂, Vancouver, British Columbia; **4,** *C. enigmatica* Laf. & Crabo, paratype ♀, Wellington, British Columbia; **5,** *C. cornuta* (Grote), ♂, Inverness, Marin County, California; **6,** *C. cornuta* (Grote), ♂, Bodega, Sonoma County, California; **7,** *C. robertsoni* Laf. & Crabo, paratype ♂, Gaviota Pass, Santa Barbara County, California; **8,** *C. robertsoni* Laf. & Crabo, paratype ♀, Gaviota Pass, Santa Barbara County, California.



FIGS. 9–12. Male genitalia of *Cerastis* spp. **9,** *C. gloriosa* Crabo & Laf., Mill Valley, California, CNC 10296; **10,** *C. enigmatica* Laf. & Crabo, Ketchikan, Alaska, CNC 11140; **11,** *C. cornuta* (Grt.), Oakland, California, CNC 11139; **12,** *C. robertsoni* Laf. & Crabo, Gaviota Pass, Santa Barbara County, California, CNC 11135.

line dentate, lower half nearly straight, excurved opposite cell; subterminal line weak, pale, undulating, with strong wedge-shaped black patches proximally opposite discal cell between median veins and near costa on radial veins; terminal line thin, weakly scalloped; claviform spot narrow, black; orbicular spot large, an elongate ellipse, usually broadly fused with reniform spot; reniform spot large, it and orbicular spot yellow gray, partially to almost completely filled with and outlined by white or light yellow scales. *Hindwing:* medium to dark fuscous with red tint; with faint median shade and discal lunule. *Abdomen:* light gray to reddish brown. *Female:* similar to male.

Male genitalia (Fig. 9). Uncus cylindrical at base, broadest at apex; with hairlike setae. Anellus heavily sclerotized laterally, covered apically with short stout spines. Juxta triangular with short dorsomedian extension. Valve 6× as long as wide, constricted near middle; apex of valve drawn to a blunt point, without corona; sacculus 1/2 as long as valve and extending to dorsal margin of valve; clavus absent; ampulla of clasper gently curved, extending posteriorly without reaching dorsal margin of valve; basal 2/3 of digitus fused to valve, distal 1/3 free, finger-like. Vesica approximately 1.5× as long as aedeagus, with simple and large bilobed subbasal diverticula; single subbasal cornutus, slightly longer than aedeagus width, gently curved; distal 2/3 of vesica U-shaped; vesica projecting ventrally at base, then bending through 180° arc to project dorsally.

Female genitalia (Fig. 13). Corpus bursae ovoid, lacking signa. Appendix bursae arising from posterior end of corpus bursae on right, shorter than corpus bursae, broad, slightly U-shaped posteriorly (apparently curving back on itself) with ductus seminalis at posterior end. Ductus bursae broad, dorsoventrally flattened, heavily sclerotized, sclerotization of ventral wall split by membranous cleft, ventral wall of ductus bursae produced ventrad into a small pouch at junction with corpus bursae. Anterior apophysis 1/4 length of posterior apophysis. Ovipositor lobes triangular, covered with short and long setae.

Type specimens. *Holotype:* ♂: WASHINGTON: Grays Harbor Co.: North Bay Bog, 0.6 mi N of the North Bay of Grays Harbor, 47.05°N 124.09°W, elev. 5 m, 12 IV 1991, leg. L. G. Crabo, Native cranberry bog. *Paratypes:* 52 ♂: OREGON: Clatsop Co.: Coastal Plain, Ocean Home Farm 1.3 mi N of Gearhart, 46.04°N 123.90°W, Elev. 25′, 24 III 1993,

L. & A. Crabo leg., bog E of last inland dunes (1 ♂). WASHINGTON: Type locality: 30 III 1991, L. G. Crabo (5 ♂), 12 IV 1991, L. G. Crabo (16 ♂), 26 III 1993, J. Troubridge (1 ♂), 1 IV 1994, J. & L. Troubridge (15 ♂); Grays Harbor Co.: 0.6 mi NW of Carlisle on Ocean Beach Rd., 47.16°N 124.10°W, elev. 20 m, 15 IV 1990, L. G. Crabo, native cranberry bog (15 ♂). The holotype is in the Canadian National Collection (Ottawa). Paratypes are in the Canadian National Collection (Ottawa), University of California (Berkeley), University of California (Davis), Oregon State University (Corvallis), and the personal collections of Lars Crabo (Bellingham, Washington), Ron Robertson (Santa Rosa, California), Jon Shepard (Nelson, British Columbia), and Jim Troubridge (Langley, British Columbia).

We restrict the type series to specimens from Washington and Oregon because of slight differences in superficial appearance and habitat preferences between these and the California populations. Most California specimens are slightly smaller (forewing length: 14–15 mm) and have more dark filling of the forewing spots than the northern populations. Also, some specimens from San Francisco Bay and Inverness lack most of the black markings and have a dark orange-brown ground color.

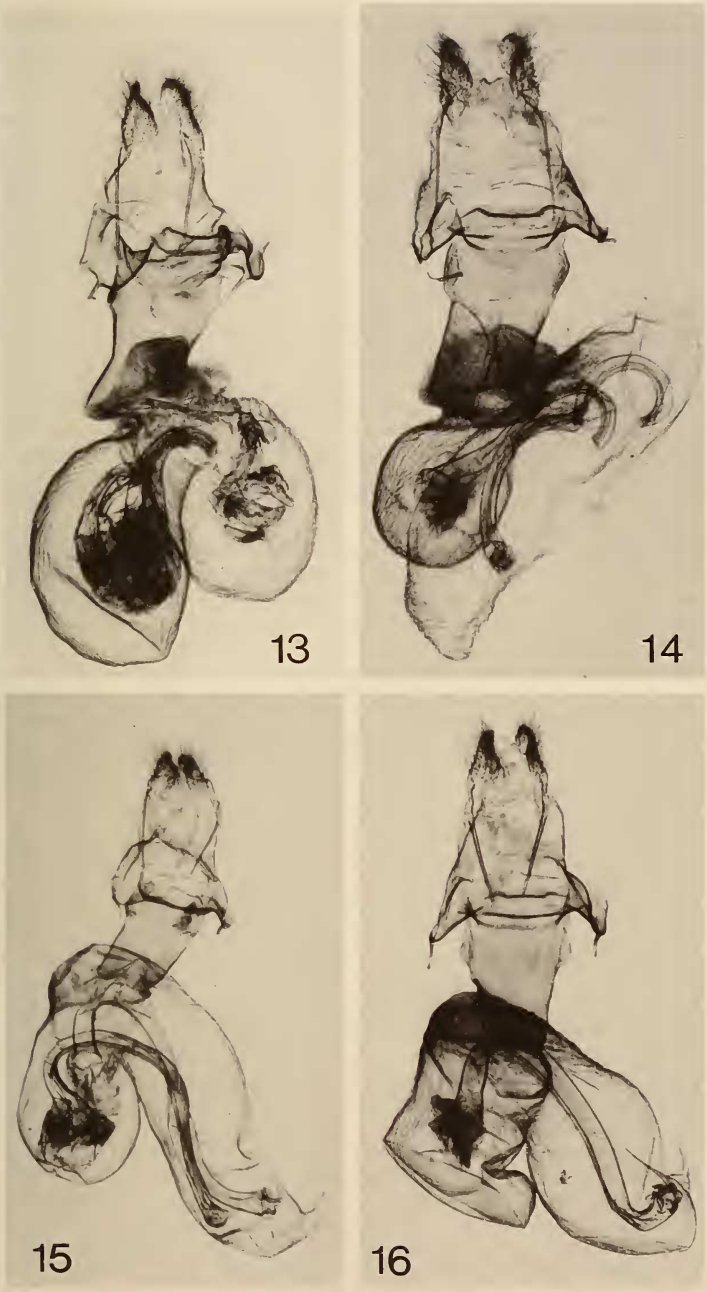
Diagnosis: This is the most distinctive species in the *C. cornuta* group; it can usually be recognized without dissection. Males have narrow antennae, 2× as wide as the central shaft, while those of other species are 3× as wide. It is the largest species. Most specimens can be recognized by subtle features of wing maculation: prominent white filling of the forewing orbicular and reniform spots; dark reddish brown forewing ground color; prominent scalloping of the forewing lines; and conspicuous black wedges in the subterminal area of the forewing. Males can be identified by several genitalic features: juxta with a short dorsomedial extention (triangular in the other species); ampulla of clasper short, not reaching the costal margin of the valve (extending beyond the valve in the other species); vesica with one large bilobed and one simple basal diverticulum (two simple diverticula in the other species). Females have an appendix bursae which is smaller than the corpus bursae with the ductus seminalis joining at its posterior end. In other species the appendix bursae is larger than the corpus bursae with the ductus seminalis at its anterior end. Some indiviuals of *C. gloriosa* from California (vicinity of San Francisco Bay) are lighter in color with reduced black shading, and they lack white filling of the forewing spots. At this locality, *C. gloriosa* might be confused with *C. cornuta*, however, the two species can be differentiated by characters of the male antennae and genitalia described above.

Distribution and biology. *C. gloriosa* occurs in two areas on the Pacific Coast: the Pacific Northwest (Clatsop County, Oregon and Grays Harbor County, Washington) and central and northern California (Humboldt, Mendocino, Sonoma, Marin, Napa, Santa Cruz, and Monterey Counties). Nearly all populations are located near the coastline. In Washington and Oregon it occurs extremely locally in sphagnum bogs within ten miles of the Pacific Ocean. This species has not been found in sphagnum bogs in Pierce or Skagit Counties, Washington or near Vancouver, British Columbia. These bogs differ from those in which *C. gloriosa* occurs in that they are located in an area that was glaciated during the Pleistocene. The types of coastal bogs where *C. gloriosa* occurs might have been more widespread when the sea level was lower, possibly accounting for the current extended distribution of this species along the West Coast. *C. gloriosa* probably occurs further north on Washington's Olympic Peninsula and possibly also in British Columbia. The California populations not restricted to bogs but occur in mesic forests (Ron Robertson, personal communication).

C. gloriosa is sympatric with the other three species in the *C. cornuta* group, but is the most localized and least common. Adults fly in January to April in California and in March and April in the Pacific Northwest. Both sexes are attracted to lights. The early stages are unknown. The species was recently discovered in California by Ron Robertson and in Washington by the senior author. Additional California specimens were found among specimens of *C. cornuta* in museum collections.

Cerastis enigmatica Lafontaine & Crabo, new species
(Figs. 3, 4, 10, 14)

Description. *Male* (Fig. 3): *Head:* reddish brown to dark gray brown; palpi reddish brown to dark gray brown; third segment lighter. *Eyes:* black. *Antennae:* bipectinate, 3× as



FIGS. 13–16. Female genitalia of *Cerastis* spp. **13,** *C. gloriosa* Crabo & Laf., Mill Valley, California, CNC 10458; **14,** *C. enigmatica* Laf. & Crabo, Duncan, British Columbia, CNC 110445; **15,** *C. cornuta* (Grt.), Mill Valley, California, CNC 10446; **16,** *C. robertsoni* Laf. & Crabo, Gaviota Pass, Santa Barbara County, California, CNC 11137.

wide as central shaft. *Thorax:* reddish brown to gray brown; collar lighter, buff to reddish tan, with darker transverse lines. *Foretibiae:* spined. *Forewing:* length: 13–15 mm; ground color variable, reddish tan to gray brown, with lighter tints, suffused with variable amounts of black in cell; basal area frequently paler or with more extensive gray scaling than medial or subterminal areas; terminal area paler reddish brown than remainder of forewing; lines double, black with pale filling; basal line faint, sinuous; antemedial line oblique, gently excurved, notched basad in fold; median shade usually obscure, when evident a wavy line extending from reniform spot to inner margin; postmedial line scalloped, excurved opposite reniform spot, lower half nearly straight; subterminal line weak, pale, undulating, with slender black wedges proximally near costa on radial veins and opposite cell between median veins; terminal line thin, weakly scalloped; claviform spot oblong, black; orbicular spot large, gray or brown, an elongate ellipse, broadly fused with reniform spot; reniform spot large, gray or brown, it and orbicular spot outlined with yellow scales. *Hindwing:* medium to dark fuscous, with darker median shade and discal lunule. *Abdomen:* light gray to reddish brown; untufted, but with long hairlike scales on tergum one. *Female* (Fig. 4): similar to male.

Male genitalia (Fig. 10). Similar to those of *C. cornuta*, except for shape of vesica. Vesica approximately 1.5x as long as aedeagus; distal 2/3 strongly curved, extending first towards left. Two simple subbasal diverticula present. Single cornutus straight.

Female genitalia (Fig. 14). Similar to *C. cornuta* except for bursa shape. Appendix bursae joined to ventral corpus bursae 1/3 from posterior end, extending toward corpus bursae anteriorly.

Type specimens. *Holotype:* ♂: British Columbia: Vancouver, 22 III 1903, ex. coll. Bush Wilson. *Paratypes:* 145 ♂, 19 ♀: ALASKA: Ketchikan, 24–29 IV (1 ♂). BRITISH COLUMBIA: Vancouver Island: Wellington, 2 IV 1903, 27 III 1906 & 4–14 II 1906, Coll. G. W. Taylor (9 ♂, 5 ♀), 25 IV 1903 & 8 & 16 IV 1904, Bryant (5 ♂, 1 ♀), 29 III 1949 & 10 IV 1949, Woodcock (3 ♂); Vancouver Island: Quamichan, 27–28 III 1907, 28 III 1908 & 4 IV 1909, G. B. Day (2 ♂, 2 ♀); Vancouver Island: Duncans, 27 III 1908, 8 IV 1908 & 1–7 IV 1908, Hanham (1 ♂, 2 ♀); Vancouver Island: Mill Bay, 14 VI 1986, K. B. Bolte (1 ♂); Vancouver, 23 III 1903, ex. coll. Bush Wilson (1 ♂), 3 IV 1904 (1 ♂), 192_, W. Downes (2 ♂); Langley, 5 km E, 1–7 IV 1991 & 1–4 IV 1992, J. Troubridge (5 ♂); Queen Charlotte Islands: Massett, 28 V 1894, J. H. Keen (1 ♂); Skagit River Valley, near N end of Ross Lake, 9 IV 1994, J. Troubridge (14 ♂); 16 IV 1994, J. Troubridge and A. & L. Crabo (15 ♂, 2 ♀). WASHINGTON: Cowlitz Co.: Columbia R. valley, 3 mi N of Kalama, SW Carroll's Bluff, 46.05°N 122.86°W, 50 m, 13 IV 1991, L. & A. Crabo leg., disturbed hillside with oak (1 ♂); Cowlitz R. valley, Toutle Rest Area on Interstate 5, 46.35°N 122.90°W, 360′, 24 III 1993, L. & A. Crabo leg., lowland forest (1 ♂); Grays Harbor Co.: Ocean City, 26 III 1993, J. Troubridge (1 ♂); North Bay Bog, 0.6 mi N of North Bay of Grays Harbor, 47.05°N 124.09°W, elev. 5 m, 12 IV 1991, L. G. Crabo leg., Native cranberry bog (1 ♂), 26 III 1993, J. Troubridge (5 ♂), 1 IV 1994, J. & L. Troubridge (3 ♂); Humptulips R. valley, Copalis Crossing, 47.10°N 124.07°W, 20 m., 30 III 1992, L. G. Crabo leg., Storefront lights (1 ♂); [Island Co.]: Deception Pass, 27 III 1993, J. Troubridge (1 ♂), 2 IV 1994, J. & L. Troubridge (1 ♂); King Co.: Factoria, 9 IV 1949, E. C. Johnson (1 ♂, 1 ♀); 7.5 mi E of North Bend on Middle Fork Snoqualmie R., 300 m, 47.50°N 121.63°W, 13 IV 1988, leg. L. Crabo (2 ♂, 2 ♀); Kitsap Co.: Bremerton, 1 IV 1948, Don Frechin (1 ♂); Klickitat Co., Columbia River Gorge, Major Creek 1/2 mi N of Columbia River, 9 IV 1994, L. G. Crabo (1 ♂); Mason Co.: Shelton, 16 IV 1949, E. C. Johnson (4 ♂); 2 mi E Little Hoquiam, Grapeview Loop Rd., 25 m, 47.31°N 122.90°W, 24 III 1990, L. Crabo leg. (4 ♂); Elfendahl Pass Rd. 0.3 mi N of Hwy. 302, 2 mi W of Belfair State Park, 47.42°N 122.91°W, elev. 50 m, 29 III 1989, L. Crabo leg. (11 ♂); Okanogan Co., Early Winters canyon, Highway 20 1 mi S of Lone Fir Campground, 7 V 1994, L. & A. Crabo and C. Coughlin (8 ♂); Pierce Co.: Puget Trough, NE corner of Cranberry Lake, 46.90°N 122.36°W, 644′, 11 III 1992, L. Crabo leg., native sphagnum bog (6 ♂); [San Juan Co.]: Orcas Island, 18 IV 1949, E. Hendriksen Coll. (1 ♂); Skagit Co., 3.5 mi SE of Big L., Cavanaugh Rd. at Grandstrom Rd., 48.32°N 122.16°W, 550′, 14 IV 1993 L. G. Crabo, sphagnum bog (1 ♂); Snohomish Co.: S. Lake Ballinger, 47.95°N 122.32°W, 25 m, 3 III 1988, leg. L. Crabo (2 ♂); Thurston Co.: 3 mi N Tenino, Rocky Prairie, 50 m., 46.89°N 122.87°W, 25 III 1990, leg. L. Crabo (2 ♂); What-

com Co.: Chuckanut Bay of Bellingham Bay, elev. 35 m, 48.69°N 122.49°W, 19 IV 1993, L. G. Crabo leg., dry rock slope (1 ♂); Skagit River Valley near N end Ross Lake, 16 IV 1994, J. Troubridge and A. & L. Crabo (4 ♂); Mt. Baker Hwy. at N Fork Nooksak River crossing, 1/2 mi N of Silver Fir Campground, 23 IV 1994, L. Crabo (19 ♂, 4 ♀); Yakima Co., Tieton River Valley, Oak Creek at Tieton R., 46.72°N 120.81°W, 550 m, 18 IV 1992, L. G. Crabo, riparian forest with oak (1 ♂).

The holotype is in the Canadian National Collection (Ottawa). Paratypes are in the Canadian National Collection (Ottawa), University of California (Berkeley), University of California (Davis), Oregon State University (Corvallis), and the personal collections of Lars Crabo (Bellingham, Washington), Ron Robertson (Santa Rosa, California), and Jim Troubridge (Langley, British Columbia).

We restrict the type series to specimens from Washington, British Columbia, and Alaska.

Diagnosis. *Cerastis enigmatica* is most similar to *C. cornuta* and *C. gloriosa*. It is sympatric with *C. gloriosa*, but can be separated from it by features described in its diagnosis. The male genitalia of *C. enigmatica* differ from those of *C. cornuta* and *C. gloriosa* by the shape of the vesica, which is strongly curved distally, not straight. Females differ from these two species in that the appendix bursae joins the corpus bursae 1/3 from its posterior end, not at the posterior end. Adults are nearly identical to *C. cornuta*, which occurs to the south of the range of *C. enigmatica*. *Cerastis enigmatica* adults tend to be slightly larger with broader wings, they have more contrasting forewing maculation, more prominent light borders surrounding the forewing spots, and slightly lighter hindwings.

Distribution and biology. *Cerastis enigmatica* is moderately common to abundant in mesic conifer forests at low elevations in the Cascade Mountains and on the west coast from the Alaska Panhandle to southern Humboldt County, California (Miranda). It also occurs on the east slope of the Cascades but is much less common there. It occurs with *C. gloriosa* in Washington, Oregon, and at Willow Creek, Humboldt County, California. The adults are active from March to late April at the time when most deciduous trees are in bloom. Both sexes are attracted to light. The early stages are unknown.

C. enigmatica is moderately common in collections but has until now been confused with *C. cornuta*. All previous records of *C. cornuta* from Oregon, Washington, Alaska, and British Columbia are *C. enigmatica*.

Cerastis cornuta (Grote)
(Figs. 5, 6, 11, 15)

Pachnobia cornuta Grote, 1874, Bull. Buffalo Soc. Nat. Sci., 2:68.
Type Locality: [California, USA]. [Lectotype in BMNH]

Type specimens. *Pachnobia cornuta* was described from "two fresh specimens" stated to be in the Collection of the Buffalo Society of Natural Sciences. A number of species said to be in that collection (e.g., *Agrotis specialis* Grote, *Agrotis formalis* Grote) have not been found in the collection of the Buffalo Museum of Science but specimens from the Grote Collection labeled "type" and exactly matching the original description are in the Natural History Museum, London. For other species (e.g., *Agrotis wilsoni* Grote) the nominal "type" in The Natural History Museum differ significantly from the description and the types must be considered to be lost. For *Pachnobia cornuta* Grote, a male in The Natural History Museum, London, purchased from the Grote Collection and labeled as a type, matches the description of the species in every detail and is hereby selected as **lectotype.** The specimen is labeled "Type/ California Grote Coll. 81–116/ *Metalepsis cornuta* Grote/ *Metalepsis cornuta* Grote Type."

Diagnosis. Adults of *C. cornuta* (Fig. 5, 6) are nearly indistinguishable from *C. enigmatica* and *C. robertsoni* and are similar to some specimens of *C. gloriosa*. The male genitalia of *C. cornuta* (Fig. 11), *C. enigmatica*, and *C. robertsoni* are indistinguishable except for the shape of the vesica. All three differ from *C. gloriosa* by the presence of a triangular juxta without median extension, longer claspers which extend beyond the dorsal margin of the valves, and the presence of two simple diverticula on the vesica. The distal portion of

the vesica of *C. cornuta* differs from those of *C. robertsoni* and *C. enigmatica* in being straight beyond the basal turn. Females of these three species are distinguished from *C. gloriosa* by having an appendix bursae which is larger than the corpus bursae, with the ductus seminalis joining it at its anterior end. The female genitalia of *C. cornuta* (Fig. 15) differ from those of *C. enigmatica* in that the appendix bursae joins the corpus bursae at its posterior end. They differ from those of *C. robertsoni* in that the corpus bursae is constricted posteriorly, the appendix bursae is even in width throughout its length and projects obliquely away from the corpus bursae anteriorly, and the ductus bursae is shorter, 1.5× as long as wide. *Cerastis cornuta* differs from *C. enigmatica* in slightly smaller size (forewing length: 11–13 mm versus 13–15 mm), less contrasting forewing pattern, and less prominent yellow outline of the orbicular and reniform spots. *Cerastis robertsoni* is slightly smaller (forewing lenth: 10–13 mm) but is difficult to separate from *C. cornuta* without dissection.

Distribution and biology. *Cerastis cornuta* is moderately common in forests in western California from Sonoma County south to Santa Clara County. It, like *C. gloriosa*, occurs near the Pacific Ocean with most records from the vicinity of San Francisco Bay. It occurs with *C. gloriosa* at a few locations. The adults are active from mid-January through late April. The early stages are unknown.

Cerastis robertsoni Lafontaine and Crabo, new species
(Figs. 7, 8, 12, 16)

Description. *Male* (Fig. 7): *Head and palpi*: appearing chestnut (actually a mixture of white, buff, brown, and black scales). *Eyes:* black. *Antennae:* bipectinate, 3× as wide as central shaft. *Thorax*: dark brownish gray; collar pale brownish gray, contrasting with darker head and thorax. *Foretibiae*: spined. *Forewing:* length: 10–13 mm; ground color light to dark brownish gray, suffused with variable amounts of black in discal cell; basal and terminal areas and costa paler gray; lines double, black, pale-filled; basal line sinuous; antemedial line oblique, gently excurved, notched towards wing base in fold; median shade wavy, evident only from reniform spot to inner margin of forewing; postmedial line scalloped, lower half nearly straight, excurved opposite discal cell; subterminal line weak, pale, undulating, with slender black wedges proximally between veins M1 and M2 and near costa on radial veins; terminal line thin, weakly scalloped; claviform spot narrow, black; orbicular spot large, variable, gray, brown, or white, variably outlined with thin pale line, broadly fused with reniform spot and often extended onto forewing costa; reniform spot narrow, oblique, angled towards orbicular spot, gray with partial black and paler gray outline. *Hindwing:* dark fuscous, with darker discal lunule and slight trace of median line. *Abdomen:* gray with long brownish gray hairs; untufted but with numerous long hairs on anterior margin of tergum one. *Female* (Fig. 8): similar to male.

Male genitalia (Fig. 12). Similar to *C. cornuta* except for size of aedeagus and shape of vesica. Aedeagus smaller than that of *C. cornuta*, but with same proportions: vesica approximately 1.5x as long as aedeagus. Vesica bending sharply ventrad 90°, then bent 90° to project to left, distal 2/3 nearly straight. Two simple subbasal diverticula present, one large and one small. Single cornutus straight.

Female genitalia (Fig. 16). Similar to *C. cornuta* except for shape of corpus bursae and length of ductus bursae. Corpus bursae broadly fused with appendix bursae, without posterior constriction. Appendix bursae constricted apically; apical portion curving dorsally to project dorsad. Ductus bursae 2x as long as wide.

Type specimens. *Holotype:* ♂: CALIFORNIA: Monterey Co.: Big Creek Res., UCNLWRS, 2 II 1994, L. Crabo, J. Powell, & R. Robertson. *Paratypes:* 38 ♂, 10 ♀: CALIFORNIA: Monterey Co.: Chualar, 11 I 1963 (1 ♂); Big Creek Res., UCNLWRS, Trail to Redwood Camp, 80 m, 24/26 I 1988, J. A. Powell (5 ♂); Big Creek Res., UCNLWRS, So. Ridge Rd., 220 m, bl. trap, 24 I 1988, J. A. Powell (1 ♂), 28 II 1989, J. Powell & M. Prentice (1 ♂, 1 ♀); Big Creek Res., UCNLWRS, So. Ridge Pt., 275 m, bl. trap, 24/26 I 1988, J. A. Powell (1 ♂); Big Creek Res., UCNLWRS, So. Gate Rd., 190–200 m, bl., 24/26 I 1988, J. A. Powell (4 ♂), 21/22 II 1988, J. A. Powell (1 ♂), 28 II 1989, J. Powell & M. Prentice (1 ♂); Big Creek Res., UCNLWRS, HQ area, 1–10 m, coastal scrub, bl. trap, 24/26 I 1988, J.

A. Powell (3 ♂, 2 ♀), 28 II 1989, J. Powell & M. Prentice (1 ♀); Big Creek Res., UCNL-WRS, 2 II 1994 L. G. Crabo, J. Powell, & R. Robertson (15 ♂, 4 ♀); Santa Barbara Co.: Gaviota Pass, 3 February 1987, Powell & Wagner, blacklight (5 ♂, 2 ♀). An additional 6 males and 1 female from the type locality and Gaviota Pass were examined but were excluded from the type series because of their poor condition.

The holotype is in the University of California (Berkeley). Paratypes are in the Canadian National Collection (Ottawa), the University of California (Berkeley), the University of California (Davis), and the personal collections of Lars Crabo (Bellingham, Washington) and Ron Robertson (Santa Rosa, California).

Diagnosis: *Cerastis robertsoni* is the smallest species of *Cerastis* in North America. It is most similar to *C. cornuta*, which occurs in central California to the north of the range of *C. robertsoni*. *Cerastis robertsoni* tends to have more gray in the forewing, and less conspicuous light-colored outlines of the forewing spots. However, there are no reliable characters for separating these species without dissection. Males of *C. robertsoni* differ from those of *C. cornuta* and *C. enigmatica* by the shape of the vesica: the distal portion of the vesica in *C. robertsoni* extends straight toward the left beyond two 90° basal bends. The female genitalia are most similar to those of *C. cornuta*, but differ by several features: the corpus bursae is broad without posterior constriction; the appendix bursae is broadly fused with the corpus bursae posteriorly and is constricted apically, curving dorsally; and the ductus bursae is longer (2× as long as wide). They differ from those of *C. enigmatica* by having the corpus bursae and appendix bursae joined at their posterior ends. *Cerastis robertsoni* is unlikely to be confused with *C. gloriosa*. However, some specimens have the forewing spots filled with pale yellow, and might mistakenly be identified as *C. gloriosa* using our key.

Distribution and biology. *Cerastis robertsoni* is known only from three localities but may occur more broadly in the Coast Range of central and southern California from Monterey Bay to Santa Barbara County. It is moderately common in California coastal chapparal habitat (J. Powell, pers. comm.) but has seldom been collected, probably because of its flight period early in the year. It is sympatric with *C. gloriosa* at the type locality in Monterey County.Adults are active in January and February. Both sexes are attracted to light. The early stages are unknown.

All but one of the known specimens of *C. robertsoni* were collected by Jerry Powell and his field associates. It was recognized as distinct from *C. cornuta* by Ron Robertson who sent specimens to the junior author for evaluation. We take pleasure in naming this species after Mr. Robertson in recognition of his contribution.

ACKNOWLEDGMENTS

Paul C. Hammond (Oregon State University, Corvallis), Steven Hayden (University of California, Davis), Martin R. Honey (The Natural History Museum, London), Robert W. Poole (National Museum of Natural History, Washington D.C.), Jerry A. Powell (University of California, Berkeley), Frederick H. Rindge (American Museum of Natural History, New York), Eric H. Metzler (Columbus, Ohio), Ronald Robertson (Santa Rosa, California), and James T. Troubridge (Langley, British Columbia) made specimens in their care available for study. Michael Fibiger provided information on the genitalia of Eurasian species of *Cerastis*. Eugenie Krelina prepared the genitalic dissections and William Lukey photographed the adults and genitalia. Jonathan P. Pelham, Jerry A. Powell, and Ronald Robertson accompanied the senior author to collect parts of the type series of *C. gloriosa* and *C. robertsoni*. Neale Maine (Gearhart, Oregon) gave permission to collect *C. gloriosa* on his property and graciously provided lodging for the freezing collectors. Jonathan P. Pelham, Rodney Crawford, and James T. Troubridge critiqued early versions of the manuscript.

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Received for publication 3 March 1996; revised and accepted 17 July 1996.